APPLICATION FOR
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FOR

VERTICAL STAND-UP POUCH WITH INTEGRATED RECLOSE STRIP

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BACKGROUND OF THE INVENTION

1. Cross-Reference to Related Application:

This application is a continuation-in-part of U.S. patent application Ser. No. 10/100,370, filed on March 18, 2002, the technical disclosure of which is hereby incorporated herein by reference.

2. Technical Field

The present invention relates to a vertical stand-up pouch having an integrated reclose strip constructed using a modified vertical form and fill packaging machine, and the method for making same, that provides for a single piece construction of a vertical stand-up bag suitable for retail snack food distribution. The invention allows for use of existing film converter and packaging technology to produce a stand-up package for moisture sensitive food products or the like with minimal increased costs and minimal modification. The resulting stand-up package may be opened, a part of the contents removed and the package resealed to prevent premature deterioration of the quality of the contents because of exposure to moisture in the air.

3. Description of Related Art

Vertical form, fill, and seal packaging machines are commonly used in the snack food industry for forming, filling, and sealing bags of chips and other like products. Such packaging machines take a packaging film from a sheet roll and forms the film into a vertical tube around a product delivery cylinder. The vertical tube is vertically sealed along its length to form a back seal. The machine applies a pair of heat-sealing jaws or facings against the tube to form a transverse seal. This transverse seal acts as the top seal on the bag below and the bottom seal on

the package being filled and formed above. The product to be packaged, such as potato chips, is dropped through the product delivery cylinder and formed tube and is held within the tube above the bottom transverse seal. After the package has been filled, the film tube is pushed downward to draw out another package length. A transverse seal is formed above the product, thus sealing it within the film tube and forming a package of product. The package below said transverse seal is separated from the rest of the film tube by cutting across the sealed area.

The packaging film used in such process is typically a composite polymer material produced by a film converter. For example, one prior art composite film used for packaging potato chips and like products is illustrated in **Figure 1**, which is a schematic of a cross-section of the film illustrating each individual substantive layer. **Figure 1** shows a sealable inside, or product side, layer **16** which typically comprises metalized oriented polypropylene ("OPP") or metalized polyethylene terephtalate ("PET"). This is followed by a laminate layer **14**, typically a polyethylene extrusion, and an ink or graphics layer **12**. The ink layer **12** is typically used for the presentation of graphics that can be viewed through a transparent outside layer **10**, which layer **10** is typically OPP or PET.

The prior art film composition shown in **Figure 1** is ideally suited for use on vertical form and fill machines for the packaging of food products. The metalized inside layer **16**, which is usually metalized with a thin layer of aluminum, provides excellent barrier properties. The use of OPP or PET for the outside layer **10** and the inside layer **16** further makes it possible to heat seal any surface of the film to any other surface in forming either the transverse seals or back seal of a package.

Typical back seals formed using the film composition shown in **Figure 1** are illustrated in **Figures 2a and 2b**. **Figure 2a** is a schematic of a "lap seal" embodiment of a back seal being formed on a tube of film. **Figure 2b** illustrates a "fin seal" embodiment of a back seal being formed on a tube of film.

With reference to **Figure 2a**, a portion of the inside metalized layer **26** is mated with a portion of the outside layer **20** in the area indicated by the arrows to form a lap seal. The seal in this area is accomplished by applying heat and pressure to the film in such area. The lap seal design shown in **Figure 2a** insures that the product to be placed inside the formed package will be protected from the ink layer by the metalized inside layer **26**.

The fin seal variation shown in **Figure 2b** also provides that the product to be placed in the formed package will be protected from the ink layer by the metalized inside layer **26**. Again, the outside layer **20** does not contact any product. In the embodiment shown in **Figure 2b**, however, the inside layer **26** is folded over and then sealed on itself in the area indicated by the arrows. Again, this seal is accomplished by the application of heat and pressure to the film in the area illustrated.

Regardless of whether a lap seal or fin seal is used for constructing a standard package using a vertical form, fill, and seal packaging machine, the end result is a package as shown in **Figure 3a** with horizontally oriented top and bottom transverse seals **31, 33**. Such package is referred to in the art as a "vertical flex bag" or "pillow pouch," and is commonly used for packaging snack foods such as potato chips, tortilla chips, and other various sheeted and extruded products. The back seal discussed with reference to **Figures 2a and 2b** runs vertically

along the bag and is typically centered on the back of the package shown in **Figure 3a**, thus not visible in **Figure 3a**. Because of the narrow, single edge base on the package shown in **Figure 3a** formed by the bottom transverse seal **33**, such prior art packages are not particularly stable when standing on one end. This shortcoming has been addressed in the packaging industry by the development of a horizontal stand-up pouch such as the embodiment illustrated in **Figures 4a, 4b, and 4c**. As can be seen by reference to said Figures, such a horizontal stand-up pouch has a relatively broad and flat base **47** having two contact edges. This allows for the pouch to rest on this base **47** in a vertical presentation. Manufacture of such horizontal stand-up pouches, however, does not involve the use of standard vertical form, fill, and seal machines but, rather, involves an expensive and relatively slow 3-piece construction using a pouch form, fill, and seal machine.

Referring to **Figures 4b and 4c**, the horizontal stand-up pouch of the prior art is constructed of three separate pieces of film that are mated together, namely, a front sheet **41**, a rear sheet **43**, and a base sheet **45**. The front sheet **41** and rear sheet **43** are sealed against each other around their edges, typically by heat sealing. The base sheet **45** is, however, first secured along its outer edges to the outer edges of the bottom of the front sheet **41** and rear sheet **43**, as is best illustrated in **Figure 4c**. Likewise, the mating of the base sheet **45** to the front sheet **41** and the rear sheet **43** is also accomplished typically by a heat seal. The requirement that such horizontal stand-up pouch be constructed of three pieces results in a package that is significantly more expensive to construct than a standard form, fill, and seal vertical flex bag.

Further disadvantages of using horizontal stand-up pouches include the initial capital expense of the horizontal stand-up pouch machines, the additional gas flush volume required during packaging as compared to a vertical flex bag, increased down time to change the bag size, slower bag forming speed, and a decreased bag size range. For example, a Polaris model vertical form, fill, and seal machine manufactured by Klick Lock Woodman of Georgia, USA, with a volume capacity of 60-100 bags per minute costs in the range of $75,000.00 per machine. A typical horizontal stand-up pouch manufacturing machine manufactured by Roberts Packaging of Battle Creek, Michigan, with a bag capacity of 40-60 bags per minute typically costs $500,000.00. The film cost for a standard vertical form, fill, and seal package is approximately $.04 per bag with a comparable horizontal stand-up pouch costing roughly twice as much. Horizontal stand-up pouches further require more than twice the oxygen or nitrogen gas flush. Changing the bag size on a horizontal stand-up pouch further takes in excess of two hours, typically, while a vertical form and fill machine bag size can be changed in a matter of minutes. Also, the typical bag size range on a horizontal stand-up pouch machine is from 4 oz. to 10 oz., while a vertical form and fill machine can typically make bags in the size range of 1 oz. to 24 oz.

One advantage of a horizontal stand-up pouch machine over a vertical form, fill, and seal machine, however, is the relatively simple additional step of adding a reclosable seal or a zipper seal at the top of the bag for reclosing of the bag. Vertical form, fill, and seal machines typically require substantial modification and/or the use of reclosable or zipper seals premounted on the film oriented horizontally to the seal facings used to seal the horizontal transverse seals.

For example, U.S. Patent No. 4, 584,201 to Boston discloses a system for applying a segment of seal strip to the external surface of a bag manufactured using a vertical form, fill, and seal machine, such that, when it is desired, the bag may be closed (*i.e.*, resealed) after it has been opened. According to the Boston '201 disclosure, the seal strip includes a peel strip which is removable to allow the package, when opened, to be folded down and sealed against an adhesive which will be exposed upon the removal of the peel strip. In accordance with the Boston '201 disclosure, the bag is typically folded a plurality of times in the direction of the seal strip and the external surface of the bag is applied to an exposed adhesive on the seal strip and thereby the bag is resealed for storage of the contents. However, the Boston '201 invention necessitate the precise placement of discrete segments of seal strip across the traverse of the sheet of packaging material such that the applied seal strip is positioned parallel to the top traverse seal on the resulting bag and perpendicular to the vertical back seal. While effective, the Boston '201 system is unduly complex. Moreover, the Boston '201 system is only directed at and adapted for the production of conventional vertical flex bags or pillow pouches.

An alternative approach taken in the prior art to producing a bag with more of a stand-up presentation is the construction of a flat bottom bag such as illustrated in **Figure 3b**. Such a bag is constructed in a method very similar to that described above with regard to prior art pillow pouches. However, in order to form the vertical gussets **37** on either side of the bag, the vertical form, fill, and seal machine must be substantially modified by the addition of two movable devices on opposite sides of the sealing carriage that move in and out to make contact with the packaging film tube in order to form the tuck that becomes the gussets **37** shown in **Figure 3b**.

Specifically, when a tube is pushed down to form the next bag, two triangular shaped devices are moved horizontally towards the packaging film tube until two vertical tucks are formed on the packaging film tube above the transverse seals by virtue of contact with these moving triangular shaped devices. While the two triangular shaped devices are thus in contact with the packaging tube, the bottom transverse seal is formed. The package is constructed with an outer layer **30** that is non-sealable, such as paper. This causes the formation of a V-shaped gusset **37** along each vertical edge of the package when the transverse seals **31, 33** are formed. While the triangular shaped devices are still in contact with the tube of packaging material, the product is dropped through the forming tube into the tube of packaging film that is sealed at one end by virtue of the lower transverse seal **33**. The triangular shaped devices are then removed from contact with the tube of packaging film and the film is pushed down for the formation of the next package. The process is repeated such that the lower transverse seal **33** of the package above and upper transverse seal **31** of the package below are then formed. This transverse seal is then cut, thereby releasing a formed and filled package from the machine having the distinctive vertical gussets **37** shown in **Figure 3b**.

The prior art method described above forms a package with a relatively broad base due to the V-shaped vertical gussets **37**. Consequently, it is commonly referred to in the art as a flat bottom bag. Such flat bottom bag is advantageous over the previously described horizontal stand-up pouch in that it is formed on a vertical form, fill, and seal machine, albeit with major modifications. However, the prior art method of making a flat bottom bag has a number of significant drawbacks. For example, the capital expense for modifying the vertical form, fill,

and seal machine to include the moving triangular-shaped devices is approximately $30,000.00 per machine. The changeover time to convert a vertical form, fill, and seal machine from a standard pillow pouch configuration to a stand-up bag configuration can be substantial, and generally in the neighborhood of one-quarter man hours. The addition of all of the moving parts required for the triangular-shaped devices to move in and out of position during each package formation cycle also adds complexity to the vertical form, fill, and seal machine, inevitably resulting in maintenance issues. Importantly, the vertical form, fill, and seal machine modified to include the moving triangular-shaped devices is significantly slower than a vertical form, fill, and seal machine without such devices because of these moving components that form the vertical gussets. For example, in the formation of a six inch by nine inch bag, the maximum run speed for a modified vertical form, fill, and seal machine using the triangular-shaped moving devices is in the range of 15 to 20 bags per minute. A standard vertical form, fill, and seal machine without such modification can construct a similarly sized pillow pouch at the rate of approximately 40 bags per minute.

Consequently, a need exists for a method to form a stand-up pouch, similar in appearance and functionality to the prior art horizontal stand-up pouches, using vertical form, fill, and seal machine technology and a single sheet of packaging film. Moreover, a need also exists for a simpler method of incorporating a reclosable strip into such a formed stand-up pouch using the vertical form, fill, and seal machine technology. This method should allow for reduced film cost per bag as compared to horizontal stand-up pouches, ease in size change, little capital outlay, and the ability to easily add a zipper seal to the bags, all while maintaining bag forming speeds

typical of vertical form, fill, and seal machine pillow pouch production. Such method should ideally produce a vertical stand-up pouch having an integrated reclose strip, and constructed of material commonly used to form standard vertical flex bags.

SUMMARY OF THE INVENTION

The proposed invention involves producing a vertical stand-up pouch or package having an integrated reclose strip, and constructed of a single sheet of packaging material using a slightly modified vertical form, fill, and seal machine. The modified machine includes a crease-forming mechanism and an apparatus for applying a reclose strip to the sheet of material. The crease-forming mechanism includes a tension bar and forming plates located below the forming tube and a stationary but adjustable tucker mechanism mounted to the frame of the machine which, when positioned between the two forming plates, creates a vertical tuck along the length of the package while it is being formed. The apparatus for applying a reclose strip is incorporated into the mechanism which supplies the continuous sheet of packaging material to the vertical form, fill, and seal machine. The reclose strip is attached along the longitudinal axis of the sheet of packaging material prior to forming the sheet into a tube in the conventional manner. The reclose strip includes a peel strip which is removable to allow the package, when opened, to be folded down and sealed against an adhesive which will be exposed upon the removal of the peel strip. In a preferred embodiment, the reclose strip comprises a length of two-sided adhesive tape.

The graphics on the packages are oriented 90° from a standard presentation such that the tuck forms the bottom of the package. The reclose strip can be easily added to the manufacture of such a vertical stand-up package since the reclose strip, which is attached along the longitudinal axis of the sheet of packaging material, can accompany the single sheet of packaging film through a vertical form, fill, and seal machine in the conventional manner. The

transverse seals on the formed package are therefore oriented vertically and the reclose strip is oriented horizontally when the package is placed on display. Thus, when opened, the top of the package can be double folded and pressed against the exposed adhesive strip thereby providing a reclosable seal feature.

The method disclosed and the package formed as a consequence is a substantial improvement over prior art horizontal stand-up pouches or packages and flat bottom bags. The method works on existing vertical form, fill, and seal machines requiring very little modification. There are no substantial moving parts or jaw carriage modifications involved with the crease-forming mechanism. Moreover, the apparatus for applying the reclose strip may be easily incorporated into the supply mechanism that supplies the continuous sheet of packaging material to the vertical form, fill, and seal machine.

The modified vertical form, fill, and seal machines can also be easily converted back to a conventional pillow pouch configuration by selectively disengaging the crease-forming mechanism and discontinuing the supply of reclose strip. The same metalized or clear laminations used as materials in pillow pouches can also be used with the invention therefore saving in per bag cost. The invention allows for the formation of bags that emulate a horizontal stand-up pouch using a completely different method that takes advantage of the economics of vertical form and fill machine technology.

The above as well as additional features and advantages of the present invention will become apparent in the following written detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will be best understood by reference to the following detailed description of illustrative embodiments when read in conjunction with the accompanying drawings, wherein:

Figures 1 is a schematic cross-section views of prior art packaging films;

Figure 2a is a schematic cross-section view of a tube of packaging film illustrating the formation of a prior art lap seal;

Figure 2b is a schematic cross-section of a tube of packaging film illustrating the formation of a prior art fin seal;

Figure 3a is a perspective view of a prior art vertical flex bag;

Figure 3b is a perspective view of a prior art flat bottom bag;

Figures 4a, 4b, and 4c are perspective views in elevation of a prior art horizontal stand-up pouch;

Figure 5 is a schematic cross-section of a tube of packaging film formed by the present invention methods;

Figure 6 is a perspective view of the tucker mechanism, forming plates, and tension bar in elevation of the present invention in relation to a forming tube and sealing jaws of a vertical form and fill machine;

Figures 7a and 7b are perspective views of the vertical stand-up bag of the present invention;

Figure 8 is a perspective view of one embodiment of the tucker mechanism of the present invention;

Figure 9 is a simplified perspective view of a form, fill, and seal machine

adapted to manufacture a stand-up package having an integrated reclose strip in accordance with the present invention;

Figure 10 is a perspective view of the apparatus for applying the reclose strip incorporated into the supply mechanism of the form, fill, and seal machine shown in Figure 9;

Figure 11 is a schematic elevation view of the apparatus for applying the reclose strip shown in Figure 10;

Figure 12 is an enlarged overhead view of a portion of the apparatus for applying the reclose strip shown in Figure 10;

Figures 13a and 13b are perspective views of the vertical stand-up bag or package having an integrated reclose strip of the present invention;

Figure 13c is a perspective view of the vertical stand-up package having an integrated reclose strip shown in Figures 13a and 13b that has been opened and subsequently folded over to reseal the top in accordance with the present invention; and

Figure 13d is a fragmentary sectional view taken along line 13d--13d of Figure 13a.

Where used in the various figures of the drawing, the same numerals designate the same or similar parts. Furthermore, when the terms "top," "bottom," "first," "second," "upper," "lower," "height," "width," "length," "end," "side," "horizontal," "vertical," and similar terms are used herein, it should be understood that these terms have reference only to the structure shown in the drawing and are utilized only to facilitate describing the invention.

All figures are drawn for ease of explanation of the basic teachings of the present invention only; the extensions of the figures with respect to number, position, relationship, and dimensions of the parts to form the preferred embodiment will be explained or will be within the skill of the art after the following teachings of the present invention have been read and

understood. Further, the exact dimensions and dimensional proportions to conform to specific force, weight, strength, and similar requirements will likewise be within the skill of the art after the following teachings of the present invention have been read and understood.

DETAILED DESCRIPTION

Figures 5 and 6 illustrate the basic components used with the method of the proposed invention. The same reference numbers are used to identify the same corresponding elements throughout all drawings unless otherwise noted. **Figure 5** is a schematic cross-section of a tube of packaging material (film) formed by the present invention method. The tube of packaging film shown in **Figure 5** is illustrated as a cross-sectional area immediately below the forming tube **101** of **Figure 6**. The tube of packaging film comprises an outer layer **116** and an inner layer **110**, and can comprise material typically used in the field of art for making a standard vertical flex bag, such as discussed in relation to **Figure 1**. The tube in **Figure 5** has been formed by sealing one sheet of film with a vertical back seal, as previously described with regard to discussions of prior art vertical form and fill machine methods.

Figure 6 shows a forming tube **101** typical in most respects to those used with prior art vertical form, fill, and seal machines. This forming tube **101** can be a cylinder, have a rectangular cross section, or any number of shapes, but is preferably cylindrical as illustrated. The film illustrated in **Figure 5** is initially formed around the forming tube **101** of **Figure 6**. This forming tube **101** is shown in elevation but would normally be integrally attached to the vertical form, fill, and seal machine. Also shown in **Figure 6** are a pair of prior art sealing jaws **108** likewise illustrated in elevation. Not shown in **Figure 6** is the sealing jaw carriage on which such sealing jaws **108** would be mounted below the forming tube **101**.

As previously described, the practice in the prior art in the manufacture of a vertical flex bag involves feeding a continuous packaging film directed around the forming tube **101**. A back

seal is formed on a single layer of film in order to create a tube of film around the forming tube **101**. The seal jaws **108** close on the thus formed tube of packaging film, thereby forming a bottom transverse seal. Product is then dropped through the forming tube **101** into the tube of packaging film. The tube is then driven downward by friction against rotating belts (not shown), and the seal jaws **108** are used to form another transverse seal above the level of the product found inside the tube. This seal is subsequently cut horizontally such that a top transverse seal is formed at the top of the filled bag below and a bottom transverse seal is formed on the tube of packaging film above. The packaging film during the prior art operation described above is oriented perpendicular to the longitudinal translation of the film so as to be readable by an operator of the machine as the film travels down the forming tube **101**. This orientation provides graphics **39** on the formed prior art bag that are readable by a consumer when the formed bag is placed on a retail display shelf while resting on its bottom transverse seal **33** as seen in **Figure 3a**. As will be described in further detail below, the orientation of the graphics on the film packaging for Applicants' invention is 90° off of the prior art orientation, such that the graphics appear sideways as viewed by the operator of the vertical form and fill machine as the film is pulled down the forming tube **101** of **Figure 6**. In other words, the graphics on the packaging film are oriented perpendicular to the direction of film travel.

The invention adds three basic components to a prior art vertical form, fill, and seal machine. Two forming plates **104** and one tension bar **102** are used to hold the packaging film tube in tension from inside the tube, as indicated by the arrows illustrated on **Figure 5**. As shown in **Figure 6**, the forming plates **104** and tension bar **102** can be attached directly to the

forming tube **101** or, alternatively, to any supporting structure on the vertical form, fill, and seal machine, as long as the forming plates **104** and tension bar **102** are positioned within the tube of packaging material, below the bottom of the forming tube **101**, and above the heat sealing jaws **108**.

Tension is applied on the outside of the film and in the opposite direction of the tension provided by the forming plates **104** by a fixed or stationary tucker mechanism **106**, alternatively referred to herein as a tucker bar **106**, positioned between said forming plates **104**. The tucker bar **106** is preferably attached to the sealing carriage for the vertical form, fill, and seal machine and is adjustable along all three axes (in/out, up/down, and front/back). Alternatively, the tucker bar **106** can be attached to the frame of the vertical form, fill, and seal machine or any other point that can supports its function outside the film tube. These adjustments in all three axes allow for the tucker bar **106** to be easily moved out of the way to convert the vertical form and fill machine back to standard operation and is accomplished, in the embodiment shown in **Figure 6**, by a tension screw **162** that can lock the tucker bar **106** in place when tightened. While the tucker bar **106** is adjustable, unlike in the prior art, it is fixed or stationary during operation. Therefore, the present invention is a substantial improvement over the art in that there are no moving parts to the tucker mechanism during bag making. This improvement is what Applicants intend to describe when referring to the tucker bar **106** as "stationary" or "fixed." Because of this stationary tucker bar feature, bag making speeds can match typical pillow pouch manufacturing rates.

When moved forward into position (*i.e.*, toward the forming plates **104**), the tucker bar **106** provides a crease or fold in the tube of the packaging film between the two forming plates **104**. This crease is formed prior to formation of the transverse seal by the seal jaws **108**. Consequently, once the transverse seal is formed, the crease becomes an integral feature of one side of the package. The vertical form and fill machine thereafter operates basically as previously described in the prior art, with the sealing jaws **108** forming a lower transverse seal, product being introduced through the forming tube **101** into the sealed tube of packaging film (which now has a crease on one side), and the upper transverse seal being formed, thereby completing the package. The major differences between a prior art package and Applicants' package, however, are that a crease is formed on one side (which later becomes the bottom of the formed package) using the fixed mechanism described and that the graphics on the packaging film used by the invention are oriented such that when the formed package is stood onto the end with the crease, the graphics are readable by a consumer.

An example of the formed package of the instant invention is shown in **Figures 7a and 7b**, which show the outside layer of the packaging film **116** with the graphics **179** oriented as previously described. As can be seen from **Figures 7a and 7b**, the construction of the invention's vertical stand-up pouch shares characteristics with the prior art vertical flex bags shown in **Figure 3a**. However, the transverse seals **131, 133** of the vertical stand-up bag of the invention are oriented vertically once the bag stands up on one end, as shown in **Figure 7b**. **Figure 7a** shows the crease **176** that was formed by the tucker bar **106** and forming plates **104** discussed in relation to **Figures 5 and 6**.

Returning to **Figure 6**, another optional feature that can be incorporated into this invention is the use of a diversion plate **160** within the forming tube **101**. This diversion plate **160**, in the embodiment illustrated, is a flat plate welded vertically inside the forming tube **101** that extends from the bottom of the forming tube **101** to some distance above (for example, at least two or three inches) the bottom of the forming tube **101**, where it then is sealed against the inside of the forming tube **101**.

The diversion plate **160** in a preferred embodiment accomplishes two functions. First, the diversion plate **160** keeps product that is dropped down the forming tube **101** away from the area where the crease is being formed on the tube of packaging film. Second, the diversion plate **160**, can be used as a channel for a gas or nitrogen flush. In such instance, the diversion plate **160** at some point above the bottom of the forming tube **101** seals at the top of the plate **160** against the forming tube **101**. Below such seal (not shown) an orifice can be drilled into the forming tube **101** in order to provide gas communication between an exterior gas (for example, nitrogen or oxygen) source and the cavity formed between the diversion plate **160** and the interior of the forming tube **101**. The diversion plate **160** as shown in **Figure 6** is a flat plate, but it should be understood that it can be of any variety of shapes, for example, having a curved surface, provided that it accomplishes the functionality of diverting the product away from the area where the tuck is formed on the tube of film.

By using the diversion plate **160** as a channel for the gas flush, the present invention eliminates the need for a separate gas tube to be placed inside the forming tube **101** that normally accomplishes the same function in the prior art. The added benefit of providing a relatively large

volume channel formed by the diversion plate **160** and the interior of the forming tube **101** is that a relatively large volume of flushing gas can be introduced into a filled and partially formed package at a significantly lower gas velocity compared to prior art gas tubes. This allows for the filling of packages using this embodiment of the present invention that may contain low weight product that might otherwise be blown back into the forming tube by prior art flushing tubes.

Figure 8 illustrates a preferred embodiment of the tucker bar **106**. This embodiment of the tucker bar **106** comprises a head **180** attached to a support **182**. Drilled within the support **182** and head **180** is a gas channel **184** shown in phantom on **Figure 8**. This gas channel **184** provides a gas communication from an exterior gas source (not shown) through the support **182**, through the head **180**, and out three orifices **186**. The gas channel **184** allows for a metered burst of pressurized gas (typically air) that helps keep the tuck illustrated in **Figure 5** taut throughout the forming and sealing operation without the necessity of moving the tucker bar in and out during bag formation. It should be noted that during operation (bag making) the tucker bar **106** is always stationary. It should further be noted that the head **180** necessarily cannot extend along the entire length of the crease formed by the tucker bar **106** and forming plates **104**. Further, it should be understood that when the sealing jaws **108** close onto the tube of film, the lateral dimensions of the tube of film change. All of these facts are compensated for by the use of the pressurized air bursting from the orifices **186**. The pressurized air keeps an even amount of pressure on the tuck as it is being formed in the various stages of the forming and sealing process. The air burst can be continuous, but is preferably metered to start as the film for the next bag is being pulled down through the completion of the transverse seal.

The head **180** can comprise any non-stick material but is preferably a fluoropolymer, such as Teflon®. In an alternative embodiment, the tucker bar **106** can comprise one integral piece of metal with the head portion **180** being coated with a fluoropolymer. The curved contact area of the head **180** allows for the continuous formation of the tuck illustrated in **Figure 5** without tearing the packaging film as it is pushed down below the forming tube. While shown with three orifices **186**, the head **180** can comprise any number of orifices from one on.

To further compensate for the change in the width of the film tube as the transverse seal is formed by the seal jaws **108** of **Figure 6**, it should be noted that the tension bar **102** bends outwardly away from the center of said tube of film along the length of the tension bar **102** and the forming plates **104** are hinged by a horizontal hinge **105**. If the tension bar **102** is designed otherwise (*e.g.*, strictly vertical) excess slack occurs in the area of the film tube near the transverse seal. The forming plates **104** comprise horizontal hinges **105** that allow the forming plates to fold inward (*i.e.*, toward each other) slightly while the lower transverse seal is formed. Otherwise, the tube of packaging film would be ripped by the tips of the forming plates **104** during this step.

The present invention offers an economic method of producing a stand-up pouch with numerous advantages over prior art horizontal stand-up pouches and methods for making them. Examples of these advantages are illustrated in Table 1 below.

TABLE 1	Current	Commercially Available Horizontal Stand-Up Pouches	Applicants' Vertical Stand-Up Bag
Machine Type	Standard Vertical FFS	Pouch Form, Fill, Seal	Standard Vertical FFS
Machine Cost	$75,000.00	$500,000.00	$75,000.00
Film Cost	$0.04/bag	$0.08/bag	$0.04/bag
Gas Flush	Less than 2% O_2	Only to 5% O_2	Less than 2% O_2
Size Change	Easy, change former	2 hours	Easy, change former
Format Change	Flex Bag Only	Stand-Up Pouch Only	Both, simple change
Continuous Feed Zipper Option .	No	Yes	Yes
Bag Size Range in Inches	(Width/Height) 5/5 through 14/24	(Width/Height) 5/5 through 10/12	(Width/Height) 5/5 through 24/11

Referring now to **Figure 9**, in another embodiment the present invention further includes an apparatus and method for producing a stand-up package having a reclose strip incorporated therein. The apparatus for applying the reclose strip is incorporated into the supply mechanism **200** that supplies a continuous sheet of packaging material or film **120** to the vertical form, fill, and seal machine **100**.

As shown in **Figure 9**, the vertical form, fill, and seal machine **100** includes a forming/fill tube **91** and a former section **92** around which a sheet of packaging material **120** is directed and formed into a tubular shape in the conventional manner. While the forming/fill tube **91** illustrated in **Figures 9** is shown as having a rectangular cross-sectional shape, it is understood that the cross-sectional shape of the forming/fill tube **91** may be any of various other shapes, such as circular, oval, or square. The forming/fill tube **91** illustrated in **Figures 9** may also have a diversion plate **160**, as previously described, incorporated therein.

As will be subsequently explained in greater detail, the supply mechanism **200** includes an apparatus incorporated therein, which attaches a length of reclose strip **140** to the underside of the sheet of packaging material **120** such that when the sheet of packaging material **120** is supplied to the vertical form, fill, and seal machine **100** and formed into a tubular shape in the conventional manner, the reclose strip **140** is positioned along a longitudinal axis on the outer surface of the formed tube **120A**.

Referring now to **Figures 10** and **11**, an embodiment of the supply mechanism **200** depicted in **Figure 9** is shown that includes an apparatus for applying a length of reclose strip **140** to the sheet of packaging material or film **120** being supplied to the vertical form, fill, and seal machine **100**. The supply mechanism **200** includes a mechanism for unrolling a sheet of packaging material **120** from a supply spool **220** so as to direct a continuous sheet towards the vertical form, fill, and seal machine **100**.

For example, in accordance with the conventional art, the supply mechanism **200** may comprise a horizontal spindle **210** and a series of rollers **212, 214**. The supply spool **220** is placed on the spindle **210** and a sheet of packaging material **120** is unrolled and fed through the series of rollers **212, 214** in the direction of arrows **a**, **b**, and **c**. The rollers **212, 214** control the speed, direction, and tension of the continuous sheet of packaging material **120** directed to the towards the vertical form, fill, and seal machine **100**. For example, roller **214** might be a powered roller which advances the sheet of packaging material **120** off the supply spool **220** while rollers **212** might be idler rollers, which support, smooth or direct the sheet of packaging material **120** during its course of travel through the supply mechanism **200** and control the tension imparted to the

sheet of packaging material **120** as it is directed towards the vertical form, fill, and seal machine **100**. In another embodiment, both the spindle **210** and roller **214** might be a powered rollers which advance the sheet of packaging material **120** off the supple spool **220** in a synchronized manner.

Of particular note, the supply mechanism **200** of the present invention also includes an apparatus for applying a length of reclose strip **140** to the sheet of packaging material or film **120**. As shown in the Figures, the apparatus includes a spool arbor **204** onto which a spool **240** of reclose strip **140** is attached, and a pivoting arm assembly **230**, which directs and applies the reclose strip **140** onto the sheet of packaging material **120**. As shown in the embodiment illustrated in the Figures, the spool arbor **204** and pivoting arm assembly **230** are positioned and supported by a support bracket **202**, which is integrally attached to the supply mechanism **200**.

The pivoting arm assembly **230** comprises a pivot arm **232** pivotally attached to the support bracket **202** by a pivot pin **234**. The pivot arm **232** is free to rotate about the pivot pin **234** in the directions shown by the arrows in **Figure 10**. The pivoting arm assembly **230** further includes an accessory plate **232a** attached to the pivot arm **232** and an application roller **236** located at the distal end of the pivot arm **232**. The accessory plate **232a** includes a roller guide mechanism **250**, a strip bar guide **256**, an extension bar **254**, and a weight assembly **238** attached thereon.

In accordance with the present invention, a length of reclose strip **140** is played out from spool **240** and applied, by means of the pivoting arm assembly **230**, to the outer peripheral surface of the sheet of packaging material **120** being advanced from the supply spool **220** as

described previously. The length of reclose strip **140** from spool **240** is threaded through a roller guide mechanism **250** and a bar guide **256** extending from accessory plate **232a**, so as to position align, and apply the length of reclose strip **140** to the sheet of packaging material **120** being advanced from the supply spool **220**. The application roller **236** located at the distal end of the pivot arm **232** further presses the length of reclose strip **140** onto the sheet of packaging material **120** ensuring a good bonding between the reclose strip **140** and the packaging material **120**. A weight assembly **238** may be attached to accessory plate **232a** to increase the force applied by the application roller **236** upon the reclose strip **140** and the sheet of packaging material **120** as well as stabilize the entire pivoting arm assembly **230**.

While the spool **240** of reclose strip **140** utilized in the present invention could theoretically be a single wound spool, as shown in the Figures and particularly in **Figure 12**, a preferred embodiment of the present invention includes a spool **240** comprised of layer of multiple windings of reclose strip **140** arranged generally adjacent to one another as illustrated. As the length of reclose strip **140** is unwound from the spool **240**, it oscillates back and forth across the width of the spool as illustrated in phantom and by the arrows.

In order to smoothly accommodate the gentle oscillation of the unwinding reclose strip **140**, the roller guide mechanism **250** is fitted with a guide frame **252**, which is pivotally attached to the an stationary extension bar **254**, extending from the accessory plate **232a**, which in turn is attached to the pivot arm **232**. The roller guide mechanism **250** may comprise a cylinder having flange elements on the outer edges that channel the lateral edges of the length of reclose strip **140**. Thus, the roller guide mechanism **250** is automatically aligned with the relative angle of the

length of reclose strip **140** unwinding from the spool **240** thereby smoothly guiding the length of reclose strip **140** along to the bar guide **256**, which aligns the length of reclose strip **140** with the sheet of packaging material **120**.

As shown particularly in **Figures 10** and **12**, the pivoting arm assembly **230** may be quickly modified to change the placement of the length of reclose strip **140** on the sheet of packaging material **120**. For example, the stationary extension bar **254** can be lengthened or shortened, thereby adjusting the lateral placement of the length of reclose strip **140** on the sheet of packaging material **120**.

Once attached to the sheet of packaging material **120** , the length of reclose strip **140** is, thereafter, continually and automatically unwound from spool **240** and applied to the sheet of packaging material **120** by the periodic advance of the sheet of packaging material **120** from the supply spool **220** of the supply mechanism **200** as described previously. Thus, as shown in the Figures, the length of reclose strip **140** is attached to the underside of the sheet of packaging material **120** such that when the sheet of packaging material **120** is supplied by the supply mechanism **200** of the present invention to the vertical form, fill, and seal machine **100** and formed into a tubular shape in the conventional manner, the reclose strip **140** is positioned along a longitudinal axis on the outer surface of the formed tube **120A**.

With reference once again to **Figure 9**, the tubular shaped packaging film **120** is driven downward by an advancing mechanism (*e.g.*, friction against rotating belts **93, 94**), whereupon a heat seal bar **95** reciprocates into contact with the tubular shaped packaging film **120** imparting a vertical back seal **130** and forming a tube **120A**. In accordance with the embodiment of the

present invention illustrated in **Figure 9**, the reciprocating heat seal bar **95** reciprocates consecutively with the advancing means. That is to say, the advancing means advances a specific length of the tubular shaped packaging film **120** and stops; whereupon the back heat seal bar **95** reciprocates imparting a vertical back seal **130.** Thus, as the formed tube **120A** is advanced down the forming/fill tube **91**, the length of reclose strip **140** attached to the exterior of the formed tube **120A** is also advanced.

Also shown in **Figure 9** are a pair of prior art sealing jaws **108** illustrated in elevation. Not shown in **Figure 9** is the sealing jaw carriage on which such sealing jaws **108** would be mounted below the forming/fill tube **91**.

At the bottom of the forming/fill tube **91**, a crease-forming mechanism, as previously described, comprised of two forming plates **104**, a fixed or stationary tucker mechanism **106**, and a tension bar **102**, is installed which modifies the standard vertical form, fill, and seal machine **100** so as to produce a stand-up packages. As with previous embodiments, the forming plates **104** can swing towards each other by rotating about a hinge **105**. This arrangement allows for the forming plates **104** to rotate towards one another and avoid ripping of the packaging film **120** when transverse seals are being formed below the forming plates **104** by the transverse seal jaws **108** as shown in **Figure 9**.

As in previously described embodiments, the two forming plates **104** and the tension bar **102** are used to hold the formed tube **120A** in tension from inside of the tube **120A**. Tension is applied on the exterior surface of the formed tube **120A** and in the opposite direction of the tension provided by the forming plates **104** by the tucker mechanism **106**, alternatively referred to

herein as a tucker bar **106**, positioned between said forming plates **104**. The tucker bar **106** is preferably attached to the sealing carriage for the vertical form, fill, and seal machine **100** and is adjustable along all three axes (in/out, up/down, and front/back).

Alternatively, the tucker bar **106** can be attached to the frame of the vertical form, fill, and seal machine **100** or any other point that can supports its function outside the film tube **120A**. These adjustments in all three axes allow for the tucker bar **106** to be easily moved out of the way to convert the vertical form and fill machine **100** back to standard operation and is accomplished, in the embodiment shown in **Figure 9**, by a tension screw **162** that can lock the tucker bar **106** in place when tightened. While the tucker bar **106** is adjustable, unlike in the prior art, it is fixed or stationary during operation.

When moved forward into position (*i.e.*, toward the forming plates **104**), the tucker bar **106** provides a crease or fold in the tube of the packaging film between the two forming plates **104**. This crease is formed prior to formation of the transverse seal by the seal jaws **108**. Consequently, once the transverse seal is formed, the crease becomes an integral feature of one side of the package.

As with previous described embodiments of the invention, the forming/fill tube **91** illustrated in **Figure 9** may also incorporate a diverter plate mechanism, like the one previously described and shown in **Figure 6**, to keep product away from the vertical gusset areas.

The vertical form, fill, and seal machine **100** of the present invention shown in **Figure 9**, thereafter operates basically as previously described in the prior art, with the sealing jaws **108** forming a lower transverse seal, product being introduced through the forming/fill tube **91** into

the sealed tube **120A** of packaging film (which now has a crease on one side and a length of reclose strip attached), and the upper transverse seal being formed, thereby completing the package.

This seal is subsequently cut horizontally across the traverse such that a top transverse seal is formed at the top of the filled bag below and a bottom transverse seal is formed on the tube of packaging film above. As previously describe, the packaging film during the prior art operation is typically oriented perpendicular to the longitudinal translation of the film so as to be readable by an operator of the machine as the film travels down the forming tube **91**. Thus, as shown in **Figure 3a**, this orientation provides graphics **39** on the formed prior art bag that are readable by a consumer when the formed bag is placed on a retail display shelf while resting on its bottom transverse seal **33**. Conversely, in accordance with the present invention, the orientation of the graphics on the film packaging is 90° off of the typical prior art orientation, such that the graphics appear sideways as viewed by the operator of the vertical form, fill, and seal machine as the film is pulled down the forming tube **91** of **Figure 9**.

An example of the resulting formed package of the instant invention is shown in **Figures 13a-13c**, which show the outside layer of the packaging film **116** with the graphics **179** oriented as previously described. As can be seen from **Figures 13a** and **13b**, the construction of the invention's vertical stand-up pouch shares characteristics with the prior art vertical flex bags shown in **Figure 3a**. However, the transverse seals **131, 133** of the vertical stand-up bag of the invention are oriented vertically and the vertical back seal **130** is oriented horizontally once the bag stands up on one end, as shown in **Figure 13b**. **Figure 13a** shows the crease **176** that is

formed by the tucker bar **106** and forming plates **104** and a segment length of reclose strip **140** positioned and applied on the package exterior as previously discussed in relation to **Figures 9-12**.

The reclose strip **140** used in the present invention may be of any conventional construction. For example, as shown in **Figure 13d**, in one embodiment the reclose strip **140** may comprise a composite of several layers of material applied to the exterior surface of the package constructed of the sheet of packaging material or film **120**. An adhesive **148** bonds a layer of tape **146** to the packaging material **120**. On the side of the tape remote from the packaging material **120** is a second adhesive **144** which has a bonding strength of less than the first adhesive **148**. The reason for this is simple. It is desired that the reclose strip **140** remain bonded to the external surface of the packaging material **120**. Therefore, the bonding strength of the adhesive **148** must be greater than that of **144**. Otherwise, the reclose strip **140** would peel off of the package when it adhered to a second surface. Because the adhesive **144** is of less peel strength than the adhesive **148**, a peel strip **142** is bonded to the adhesive **144** and serves the purpose of preventing premature bonding of the reclose strip **140** to undesired surfaces.

In typical use, the resulting vertical stand-up pouch or package having an integrated reclose strip shown in **Figures 13a** and **13b** is opened by cutting or tearing the top portion **118** of the package to provide an opening allowing the user to retrieve the contents of the package or a part thereof. Oftentimes, not all the contents of a package is consumed at one time and thus the desire to close and reseal the package is achieved where the package is manufactured according to the above discussed procedure. As shown in **Figure 13d**, the package may be opened to

remove part of the contents and resealed to prevent moisture from causing premature deterioration of the contents; the peel strip **142** has been stripped away from the adhesive **144** and two or more folds are made in the top portion **118** of the package in a direction toward the reclose strip **140**. The folded portion of the package which previously represented the side of the package away from the reclose strip **140** is adhered to the reclose strip **140** and thereby the package may be returned to a storage compartment for subsequent retrieval and consumption.

While the reclose strip **140** is functional anyplace on the package, it is desirable that the reclose strip **140** be applied on the upper half of the resulting package and preferably a position about one-third of the way down from the top portion **118** of the resulting package. Placing the reclose strip **140** on the lower half of the bag could cause the user to crush the contents remaining in the bag when it is resealed. However, the exact location of the reclose strip **140** depends upon the goods being packaged.

Thus, as shown by comparing **Figures 3a-3c** with **Figures 13a-13c**, the major differences between a prior art package and this embodiment of Applicants' package are that a crease **176** is formed on one side (which later becomes the bottom of the formed package) using the fixed mechanism described, that a length of reclose strip **140** is attached to the exterior of the formed package using the apparatus incorporated into the supply mechanism **200** described, and that the graphics on the packaging film used by the invention are oriented such that when the formed package is stood onto its end with the creased end generally at the bottom, the graphics are readable by a consumer and the integrated reclose strip is oriented generally parallel to the top of the package.

As noted previously, the added ability to attach the length of reclose strip **140** to a package available on Applicants' invention, is not available using current vertical form, fill, and seal machine technology. This is due, in part, to the orientation of the film graphics used on the packaging film of the present invention. Since the graphics are oriented 90° from the prior art, a length of reclose strip **140** can be run longitudinally along the forming tube adjacent with the packaging film as it is being formed into a tube and subsequent package. This is not possible with the prior art, because such orientation of a vertical length of reclose strip would place such a strip in a vertical orientation once the package is formed and stood up for display

The invention is further an improvement over methods for manufacturing prior art flat bottom bags. Since the tucker mechanism of Applicants' invention is stationary during bag formation, the present invention eliminates the need for moving parts that push against the film tube for the formation of a gusset. This elimination of moving parts allows for increased bag production rates, significantly lower changeover times to pillow pouch production, and significantly fewer maintenance issues.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention.